

REMARKSAmendments

Claim 1 has been amended to recite that the electrical system comprises a secondary battery. Basis is found in original claim 2. Claim 11 has been amended in view of the amendment to claim 1. These amendments have been made in the interest of rapid prosecution and without prejudice to Applicants' right to prosecute claims of similar or different scope to the unamended claims in one or more continuation applications.

The Rejection Under 35 USC § 103(a)

Applicants respectfully traverse the rejection of claims 1, 2, 4-7, 10, and 11 under 35 USC § 103(a) as unpatentable over Ikeda (U.S. Patent No. 6,963,477) in view of Myong et al. (U.S. Patent No. 6,356,424), insofar as the rejection is applicable to the amended claims.

The present claims are directed to an overheat protection device comprising a variable resistive element which is a polymer PTC element that changes resistance as a function of temperature. The device further comprises a switching element which controls a current flowing through an electrical system depending on an applied voltage thereto. The electrical system comprises a secondary battery, i.e. a battery that is rechargeable and thus requires overcharge protection. The variable resistive element is located on and thermally combined with a certain position of the electrical system and interrupts the current flowing through the electrical system by changing the applied voltage to the switching element when the certain position comes to be under a high temperature condition. In contrast to conventional systems in which detection of a temperature anomaly and the restriction of current once the temperature anomaly is detected is done by the variable resistive element only, the present claims recite a device in which the variable resistive element is used in combination with the switching element. The variable resistive element changes the applied voltage to the switching element and interrupts the current flowing through the system. It is thus possible to effectively prevent the overheating by promptly detecting the temperature anomaly of the electrical system while the decrease in power efficiency of the electrical system is low. In one embodiment, a plurality of variable resistive elements are used and can be positioned on various portions of the electrical system, e.g. on the secondary battery. Because polymer PTC elements increase significantly, i.e. several decades, in resistance over a very narrow temperature range, it is possible to provide switching over a narrow range.

Ikeda discloses a circuit in which a semiconductor switching element interrupts the current path from a power supply to a load. A conductive operation is shifted to an interrupt operation by using a change in resistance of a first PTC thermistor when the temperature of a temperature detection portion increases and reaches a predetermined interrupt temperature. When the temperature of the temperature detection portion decreases and reaches a return temperature, the interrupt operation is shifted to a conductive operation by using a change in the resistance of a second PTC thermistor. Both PTC thermistors are thermally coupled to the temperature detection portion. Unlike the present claims, Ikeda teaches the use of ceramic PTC devices (see Column 6, lines 8-13). There is no disclosure of polymer PTC devices, which have sharper switching temperatures than ceramic PTC devices. Because the switch from a low resistance to a high resistance occurs over a smaller temperature range for a polymer PTC device, such polymer PTC devices allow the circuit to go from a higher to a lower voltage without using a separate control element as is required by Ikeda. Nor does Ikeda disclose the use of a secondary battery as is recited in the present claims. In fact, while Column 4, lines 56-58, refers to the presence of a “DC power supply, for example, . . . battery”, there is no teaching or suggestion that such battery could or should be a secondary (i.e. rechargeable) battery.

The deficiencies of Ikeda are not resolved by the addition of Myong et al. Myong discloses an electrical protection system in which (a) a PTC device is thermally coupled with a resistive device and (b) a relay coil is coupled with relay contacts, the series combination of (a) and (b) resulting in a control element. The PTC device can be a polymer PTC device. The protection system, referred to as a TLPRR system (Thermally Linked PTC device, Resistor and Relay), is useful in automobiles and other complex electrical systems. There is no disclosure or suggestion that Myong includes a secondary battery.

The above comments apply to the dependent claims, as well. In particular, claim 4 recites the use of a plurality of variable resistive elements connected in series. As indicated above, Ikeda discloses the presence of two PTC devices, but these are not connected in the manner recited in claim 4. In fact, Figure 1 of Ikeda shows two PTC devices connected in parallel. In addition, the electrical connection shown in Ikeda of the two PTC devices is essential for the operation of Ikeda's circuit, and one looking to make an overheat protection device of the type currently claimed would not be taught that from Ikeda.

Disclosure Under 37 CFR § 1.56

In fulfilling the duty of candor and good faith, the following documents are hereby disclosed to the Patent Office in accordance with 37 CFR § 1.56. It is not admitted that the information in the listed documents is material to patentability as defined in 37 CFR § 1.56(b). The Examiner is requested to consider the documents in the examination of this application.

Accompanying this statement are Forms PTO/SB/08A and PTO/SB/08B in duplicate on which the documents are listed. The Examiner is requested to return an initialed and signed copy of the forms once the documents have been considered.

The following documents were cited by the European Patent Office in the Supplementary European Search Report for European Application No. 04799460 which is a counterpart for this application. Two documents were cited in category "X" as a document "particularly relevant if taken alone"; two documents were cited in category "A" as "technological background". A copy of the Search Report is attached.

U.S. PATENT DOCUMENTS

Document Number	Publication Date	Name of Patentee or Applicant	Category
US-5,963,019	10-05-1999	Cheon	X

FOREIGN PATENT DOCUMENTS

Document Number	Publication Date	Name of Patentee or Applicant	Translation	Category
JP-11-215716-A	08-06-1999	Matsushita Electric Industrial Co. Ltd	Abstract	X
EP-0766362-A*	04-02-1997	Motorola Inc.	N/A	A

* Counterpart of U.S. Patent No. 5,684,663, issued November 4, 1997

Also cited in category A was Japanese Publication No. 2000-152516-A (Umezawa (NEC Saitama, Ltd.)), published May 30, 2000, previously sent with the Disclosure Statement under 37 CFR § 1.56 dated November 12, 2008.

The following documents were cited during the examination of Japanese Patent Application No. 2005-515293, which is a counterpart of this application. Also cited was

Japanese Publication No. 2000-152516-A referred to above. All documents were cited by the Examiner to show obviousness of the Japanese claims.

FOREIGN PATENT DOCUMENTS

Document Number	Publication Date	Name of Patentee or Applicant	Translation
JP-10-270094-A	10-09-1998	Toyota Motor Corp. (Takatsu et al.)	Abstract
JP-58-75439-U	05-21-1983		No, see below

No abstract or translation is available to Applicants for Japanese Utility Model 58-075439. However, during the course of examination, the Japanese Examiner referred to the claim of this utility model, and to page 3, lines 16-18, which have been translated as follows:

Claim: 1. A charging circuit, comprising a PTC thermistor inserted in an output pathway of a power circuit in series so that a battery to be charged is electrically conducted.

Page 3, lines 16-18: “(1) electric current is suppressed by the function of the PTC thermistor when charging current to a battery 4 is over-currented or short-circuited”.

Copies of Documents

In accordance with 37 CFR §1.98(a)(2), copies of the foreign patents and foreign patent publications listed above are enclosed. A copy of the listed U.S. patent is not being submitted, although a copy will be sent on request.

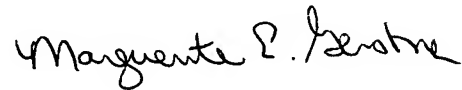
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Applicants believe that because this Disclosure Statement is being submitted with this RCE, no fee is due. If this is incorrect, please charge any necessary fee to Deposit Account No. 18-0560.

Conclusion

It is believed that this application is now in condition for allowance and such action at an early date is earnestly requested. If, however, there are any outstanding issues which can be usefully discussed by telephone, the Examiner is asked to call the undersigned.

Respectfully submitted,

A handwritten signature in cursive script, reading "Marguerite E. Gerstner".

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